600, a hybridization complex can be formed between the immobilized polynucleotide, the capture probe and the target nucleic acid in the AT incubator 602, thus immobilizing the target nucleic acid. In the AT incubator 602, the hybridization conditions are such that the polythymidine tail of the immobilized polynucleotide can hybridize to the polyadenine tail of the capture probe. Provided target nucleic acid has hybridized with the capture probe in the annealing incubator 600, a hybridization complex can be formed between the immobilized polynucleotide, the capture probe and the target nucleic acid in the AT incubator 602, thus immobilizing the target nucleic acid.

During active temperature binding incubation, the carousel assembly 1656 (or 671) of the active temperature and pre-read cool-down incubator 602 rotates the MTU to the exit door 624, also known as the number two, or left-side, distributor door, from which the MTU 160 can be removed by the left-side transport mechanism 502. The left-side transport mechanism 502 removes the MTU 160 from the active temperature and pre-read cool-down incubator 602 and places it into an available magnetic separation wash station 800.

Temperature ramping stations 700 can be a bottle neck in the processing of a number of MTUs through the chemistry deck 200. It may be possible to use underutilized MTU stations 676 in one or more of the incubators in which temperature sensitivity is of less concern. For example, the active temperature binding process which occurs within the active temperature and pre-read cool-down incubator 602 at about 40°C is not as temperature sensitive as the other incubators, and up to fifteen (15) of the incubator's thirty (30) MTU stations 676 may be unused at any given time. As presently contemplated, the chemistry deck has only about eight ramp-up stations, or heaters. Accordingly, significantly more MTUs can be preheated within the unused slots of the active temperature and pre-read cool-down incubator 602 than within the ramp-up stations 700. Moreover, using unused incubator slots instead of heaters allows the omission of some or all of the heaters, thus freeing up space on the chemistry deck.

MAGNETIC SEPARATION WASH STATIONS

Turning to FIGURES 24-25, each magnetic separation wash station 800 includes a module housing 802 having an upper section 801 and a lower section 803. Mounting flanges 805, 806 extend from the lower section 803 for mounting the magnetic separation wash station 800 to the datum plate 82 by means of suitable mechanical fasteners. Locator pins 807 and 811 extend from the bottom of lower section 803 of housing 802. Pins 807 and 811 register with

apertures (not shown) formed in the datum plate 82 to help to locate the magnetic separation wash station 800 on the datum plate 82 before the housing 802 is secured by fasteners.

A loading slot 804 extends through the front wall of the lower section 803 to allow a transport mechanism (e.g. 502) to place an MTU 160 into and remove an MTU 160 from the magnetic separation station 800. A tapered slot extension 821 surrounds a portion of the loading slot 804 to facilitate MTU insertion through the slot 804. A divider 808 separates the upper section 801 from the lower section 803.

A pivoting magnet moving structure 810 is attached inside the lower section 803 so as to be pivotable about point 812. The magnet moving structure 810 carries permanent magnets 814, which are positioned on either side of an MTU slot 815 formed in the magnet moving structure 810. Preferably five magnets, one corresponding to each individual receptacle vessel 162 of the MTU 160, are held in an aligned arrangement on each side of the magnet moving structure 810. The magnets are preferably made of neodymium-iron-boron (NdFeB), minimum grade n-35 and have preferred dimensions of 0.5 inch width, 0.3 inch height, and 0.3 inch depth. An electric actuator, generally represented at 816, pivots the magnet moving structure 810 up and down, thereby moving the magnets 814. As shown in FIGURE 25, actuator 816 preferably comprises a rotary stepper motor 819 which rotates a drive screw mechanism coupled to the magnet moving structure 810 to selectively raise and lower the magnet moving structure 810. Motor 819 is preferably an HSI linear stepper actuator, model number 26841-05, available from Haydon Switch and Instrument, Inc. of Waterbury, Connecticut.

A sensor 818, preferably an optical slotted sensor, is positioned inside the lower section 803 of the housing for indicating the down, or "home", position of the magnet moving structure 810. Sensor 818 is preferably an Optek Technology, Inc., model number OPB980T11, available from Optek Technology, Inc. of Carrollton, Texas. Another sensor 817, also preferably an Optek Technology, Inc., model number OPB980T11, optical slotted sensor, is preferably provided to indicate the up, or engaged, position of the magnet moving structure 810.

An MTU carrier unit 820 is disposed adjacent the loading slot 804, below the divider 808, for operatively supporting an MTU 160 disposed within the magnetic separation wash station 800. Turning to FIGURE 26, the MTU carrier unit 820 has a slot 822 for receiving the upper end of an MTU 160. A lower fork plate 824 attaches to the bottom of the carrier unit 820 and supports the underside of the connecting rib structure 164 of the MTU 160 when slid into the carrier unit 820 (see FIGURES 27 and 28). A spring clip 826 is attached to the carrier unit

820 with its opposed prongs 831, 833 extending into the slot 822 to releasably hold the MTU within the carrier unit 820.

An orbital mixer assembly 828 is coupled to the carrier unit 820 for orbitally mixing the contents of an MTU held by the MTU carrier unit 820. The orbital mixer assembly 828 includes a stepper motor 830 mounted on a motor mounting plate 832, a drive pulley 834 having an eccentric pin 836, an idler pulley 838 having an eccentric pin 840, and a belt 835 connecting drive pulley 834 with idler pulley 838. Stepper motor 830 is preferably a VEXTA, model number PK245-02A, available from Oriental Motors Ltd. of Tokyo, Japan, and belt 835 is preferably a timing belt, model number A 6G16-170012, available from SDP/SI of New Hyde Park, New York. As shown in FIGURES 25 and 26, eccentric pin 836 fits within a slot 842 formed longitudinally in the MTU carrier unit 820. Eccentric pin 840 fits within a circular aperture 844 formed in the opposite end of MTU carrier unit 820. As the motor 830 turns the drive pulley 834, idler pulley 838 also rotates via belt 835 and the MTU carrier unit 820 is moved in a horizontal orbital path by the eccentric pins 836, 840 engaged with the apertures 842, 844, respectively, formed in the carrier unit 820. The rotation shaft 839 of the idler pulley 838 preferably extends upwardly and has a transverse slot 841 formed therethrough. An optical slotted sensor 843 is disposed at the same level as the slot 841 and measures the frequency of the idler pulley 838 via the sensor beam intermittently directed through slot 841 as the shaft 839 rotates. Sensor 843 is preferably an Optek Technology, Inc., model number OPB980T11, sensor, available from Optek Technology, Inc. of Carrollton, Texas.

Drive pulley 834 also includes a locator plate 846. Locator plate 846 passes through slotted optical sensors 847, 848 mounted to a sensor mounting bracket 845 extending from motor mounting plate 832. Sensors 847, 848 are preferably Optek Technology, Inc., model number OPB980T11, sensors, available from Optek Technology, Inc. of Carrollton, Texas. Locator plate 846 has a plurality of circumferentially spaced axial openings formed therein which register with one or both sensors 847, 848 to indicate a position of the orbital mixer assembly 828, and thus a position of the MTU carrier unit 820.

Returning to FIGURE 24, wash buffer solution delivery tubes 854 connect to fittings 856 and extend through a top surface of the module housing 802. Wash buffer delivery tubes 854 extend through the divider 808 via fittings 856, to form a wash buffer delivery network.

As shown in FIGURES 27 and 28, wash buffer dispenser nozzles 858 extending from the fittings 856 are disposed within the divider 808. Each nozzle is located above a respective